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DATE October 15, 2003
NAME Examiner M. Rao
COMPANY U.S. Patent and Trademark Office
FAX NUMBER 703/746-5263

FROM Jo Anne Tyson for Janell T. Cleveland, Patent Agent
REFERENCE NO. 07121.0003U1
OUR FAX NUMBER 678-420-9301
NUMBER OF PAGES 29

Re: Applicant: Sung, Wing L.
Application No. 09/990, 874
Filing Date: November 21, 2001
Title: "Xylanases with Enhanced Thermophilicity and Alkalophilicity"

Examiner Rao, thank you for granting us a telephonic interview today (October 15, 2003) regarding the above-referenced patent application. As we discussed, enclosed for your review is a paper copy of the Sequence Listing initially filed with the PTO on April 22, 2002. A copy of the return postcard transmitting the Sequence Listing, with the PTO date stamp affixed, is also enclosed. If you have additional questions or if additional information is needed, please feel free to contact us at your convenience.



Janell Cleveland, Patent Agent, Reg. No. 53,848
CONFIDENTIALITY NOTE

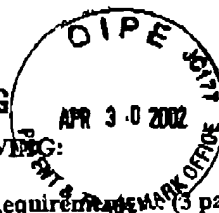
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SIR: PLEASE ACKNOWLEDGE RECEIPT OF THE FOLLOWING:

- (X) Communication in Response to Notice to Comply with Requirements (3 pages)
- (X) Copy of Notice to Comply with Requirements for Patent Applications Containing Nucleotide Sequence ... (2 pages)
- (X) Sequence Listing (27 pages), Sequence Listing Diskette
- (X) Preliminary Amendment (7 pages), Marked-up Version Showing Changes Made (3 pages), Sheets showing text deleted or added (7 pages)
- (X) Certificate of Mailing: April 22, 2002

In RE Application of: Wing L. Sung

TITLE: "XYLAASES WITH ENHANCED THERMOPHILICITY AND ALKALOPHILICITY"

SERIAL NO.: 09/990,874
REF. NO.: 07121.0003U1
CONFIRMATION NO.: 2196

FILED: November 21, 2001
(GDS/jat)

1st 05/09/02

SEQUENCE LISTING

<110> Sung, Wing

<120> Xylanases with Enhanced Thermophilicity and Alkalophilicity

<130> 07121.0003U1

<160> 54

<170> PatentIn version 3.0

<210> 1

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<212> PRT

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<400> 1

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Ser Tyr Leu Ala Val Tyr Gly Trp Val Asn Tyr Pro Gly Ala Glu Tyr
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Asp Thr Arg Ile Asn Glu Pro Ser Ile Thr Gly Thr Ser Thr Phe Thr
115          120          125
Gln Tyr Phe Ser Val Arg Glu Ser Thr Arg Thr Ser Gly Thr Val Thr
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<213> Aspergillus tubigenensis

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 35 40 45

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 50 55 60

Ala Ser Tyr Leu Ala Val Tyr Gly Trp Val Asn Tyr Pro Gln Ala Glu
 65 70 75 80

Tyr Tyr Ile Val Glu Asp Tyr Gly Asp Tyr Asn Pro Cys Ser Ser Ala
 85 90 95

Thr Ser Leu Gly Thr Val Tyr Ser Asp Gly Ser Thr Tyr Gln Val Cys
 100 105 110

Thr Asp Thr Arg Ile Asn Glu Pro Ser Ile Thr Gly Thr Ser Thr Phe
 115 120 125

Thr Gln Tyr Phe Ser Val Arg Glu Ser Thr Arg Thr Ser Gly Thr Val
 130 135 140

Thr Val Ala Asn His Phe Asn Phe Trp Ala His His Gly Phe His Asn
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<210> 3

<211> 185

<212> PRT

<213> Bacillus circulans

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 35 40 45

Arg Thr Ile Asn Tyr Asn Ala Gly Val Trp Ala Pro Asn Gly Asn Gly
 50 55 60

Tyr Leu Thr Leu Tyr Gly Trp Thr Arg Ser Pro Leu Ile Glu Tyr Tyr
 65 70 75 80

Val Val Asp Ser Trp Gly Thr Tyr Arg Pro Thr Gly Thr Tyr Lys Gly
 85 90 95

Thr Val Lys Ser Asp Gly Gly Thr Tyr Asp Ile Tyr Thr Thr Thr Arg
 100 105 110

Tyr Asn Ala Pro Ser Ile Asp Gly Asp Arg Thr Thr Phe Thr Gln Tyr
 115 120 125

Trp Ser Val Arg Gln Ser Lys Arg Pro Thr Gly Ser Asn Ala Thr Ile
 130 135 140

Thr Phe Thr Asn His Val Asn Ala Trp Lys Ser His Gly Met Asn Leu
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Ser Gly Ser Ser Asn Val Thr Val Trp
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<212> PRT

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Lys Gly Lys Lys Phe Asp Ser Thr Arg Thr His His Gln Leu Gly Asn
50 55 60

Ile Ser Ile Asn Tyr Asn Ala Ser Phe Asn Pro Ser Gly Asn Ser Tyr
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85 90 95

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100 105 110

Phe Tyr Ala Asp Gly Gly Thr Tyr Asp Ile Tyr Glu Thr Thr Arg Val
115 120 125

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Val Arg Gln Thr Lys Arg Thr Ser Gly Thr Val Ser Val Ser Ala His
145 150 155 160

Phe Arg Lys Trp Glu Ser Leu Gly Met Pro Met Gly Lys Met Tyr Glu
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<211> 185

<212> PRT

<213> Bacillus subtilis

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35 40 45

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 Val Val Asp Ser Trp Gly Thr Tyr Arg Pro Thr Gly Thr Tyr Lys Gly
 85 90 95
 Thr Val Lys Ser Asp Gly Gly Thr Tyr Asp Ile Tyr Thr Thr Thr Arg
 100 105 110
 Tyr Asn Ala Pro Ser Ile Asp Gly Asp Arg Thr Thr Phe Thr Gln Tyr
 115 120 125
 Trp Ser Val Arg Gln Ser Lys Arg Pro Thr Gly Ser Asn Ala Thr Ile
 130 135 140
 Thr Phe Ser Asn His Val Asn Ala Trp Lys Ser His Gly Met Asn Leu
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 35 40 45
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 50 55 60
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 65 70 75 80
 Asn Tyr Gln Pro Tyr Gly Asn Ser Tyr Leu Cys Val Tyr Gly Trp Thr
 85 90 95

Ser Ser Pro Leu Val Glu Tyr Tyr Ile Val Asp Ser Trp Gly Ser Trp
 100 105 110
 Arg Pro Pro Gly Gly Thr Ser Lys Gly Thr Ile Thr Val Asp Gly Gly
 115 120 125
 Ile Tyr Asp Ile Tyr Glu Thr Thr Arg Ile Asn Gln Pro Ser Ile Gln
 130 135 140
 Gly Asn Thr Thr Phe Lys Gln Tyr Trp Ser Val Arg Arg Thr Lys Arg
 145 150 155 160
 Thr Ser Gly Thr Ile Ser Val Ser Lys His Phe Ala Ala Trp Glu Ser
 165 170 175
 Lys Gly Met Pro Leu Gly Lys Met His Glu Thr Ala Phe Asn Ile Glu
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 Ile Gly Lys
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<210> 7

<211> 206

<212> PRT

<213> Clostridium stercorarium

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 35 40 45
 Arg Lys Gly Arg Lys Phe Asn Ser Asp Lys Thr Tyr Gln Glu Leu Gly
 50 55 60
 Asp Ile Val Val Glu Tyr Gly Cys Asp Tyr Asn Pro Asn Gly Asn Ser
 65 70 75 80
 Tyr Leu Cys Val Tyr Gly Trp Thr Arg Asn Phe Leu Val Glu Tyr Tyr
 85 90 95
 Ile Val Glu Ser Trp Gly Ser Trp Arg Pro Pro Gly Ala Thr Pro Lys
 100 105 110

Gly Thr Ile Thr Gln Trp Met Ala Gly Thr Tyr Glu Ile Tyr Glu Thr
115 120 125

Thr Arg Val Asn Gln Pro Ser Ile Asp Gly Thr Ala Thr Phe Gln Gln
130 135 140

Tyr Trp Ser Val Arg Thr Ser Lys Arg Thr Ser Gly Thr Ile Ser Val
145 150 155 160

Thr Glu His Phe Lys Gln Trp Glu Arg Met Gly Met Arg Met Gly Lys
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<211> 211

<212> PRT

<213> Ruminoccus flavefaciens

<400> 8

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35 40 45

Arg Met Gly Lys Asn Tyr Asp Ser Gln Lys Lys Asn Tyr Lys Ala Phe
50 55 60

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65 70 75 80

Ser Tyr Met Cys Val Tyr Gly Trp Thr Arg Asn Pro Leu Met Glu Tyr
85 90 95

Tyr Ile Val Glu Gly Trp Gly Asp Trp Arg Pro Pro Gly Asn Asp Gly
100 105 110

Glu Val Lys Gly Thr Val Ser Ala Asn Gly Asn Thr Tyr Asp Ile Arg
115 120 125

Lys Thr Met Arg Tyr Asn Gln Pro Ser Leu Asp Gly Thr Ala Thr Phe
130 135 140

Pro Gln Tyr Trp Ser Val Arg Gln Thr Ser Gly Ser Ala Asn Asn Gln
145 150 155 160

Thr Asn Tyr Met Lys Gly Thr Ile Asp Val Ser Lys His Phe Asp Ala
165 170 175

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<210> 9

<211> 197

<212> PRT

<213> Schizophyllum commune

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35 40 45

Gly Lys Gly Trp Asn Pro Gly Ala Ala Ser Arg Ser Ile Ser Tyr Ser
50 55 60

Gly Thr Tyr Gln Pro Asn Gly Asn Ser Tyr Leu Ser Val Tyr Gly Trp
65 70 75 80

Thr Arg Ser Ser Leu Ile Glu Tyr Tyr Ile Val Glu Ser Tyr Gly Ser
85 90 95

Tyr Asp Pro Ser Ser Ala Ala Ser His Lys Gly Ser Val Thr Cys Asn
100 105 110

Gly Ala Thr Tyr Asp Ile Leu Ser Thr Trp Arg Tyr Asn Ala Pro Ser
115 120 125

Ile Asp Gly Thr Gln Thr Phe Glu Gln Phe Trp Ser Val Arg Asn Pro
130 135 140

Lys Lys Ala Pro Gly Gly Ser Ile Ser Gly Thr Val Asp Val Gln Cys
145 150 155 160

His Ph Asp Ala Trp Lys Gly Leu Gly Met Asn Leu Gly Ser Glu His
165 170 175

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180 185 190

Thr Ile Thr Val Thr
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<210> 10

<211> 191

<212> PRT

<213> Streptomyces lividans Xyl B

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35 40 45

Ala Gly Lys Gly Trp Ala Asn Gly Gly Arg Arg Thr Val Gln Tyr Ser
50 55 60

Gly Ser Phe Asn Pro Ser Gly Asn Ala Tyr Leu Ala Leu Tyr Gly Trp
65 70 75 80

Thr Ser Asn Pro Leu Val Glu Tyr Tyr Ile Val Asp Asn Trp Gly Thr
85 90 95

Tyr Arg Pro Thr Gly Glu Tyr Lys Gly Thr Val Thr Ser Asp Gly Gly.
100 105 110

Thr Tyr Asp Ile Tyr Lys Thr Thr Arg Val Asn Lys Pro Ser Val Glu
115 120 125

Gly Thr Arg Thr Phe Asp Gln Tyr Trp Ser Val Arg Gln Ser Lys Arg
130 135 140

Thr Gly Gly Thr Ile Thr Thr Gly Asn His Phe Asp Ala Trp Ala Arg
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<210> 11

<211> 191

<212> PRT

<213> Streptomyces lividans Xyl C

<400> 11

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Phe	Asn	Pro	Val	Gly	Asn	Gly	Tyr	Gly	Cys	Leu	Tyr	Gly	Trp	Thr	Ser	65	70	75	80
Asn	Pro	Leu	Val	Glu	Tyr	Tyr	Ile	Val	Asp	Asn	Trp	Gly	Ser	Tyr	Arg	85	90	95	
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Lys	Thr	Phe	Gln	Gln	Tyr	Trp	Ser	Val	Arg	Gln	Ser	Lys	Val	Thr	Ser	130	135	140	
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Ala	Gly	Met	Asn	Met	Gly	Gln	Phe	Arg	Tyr	Tyr	Met	Ile	Asn	Ala	Thr	165	170	175	
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<212> PRT

<213> Streptomyces sp. No. 36a

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 35 40 45

Lys Gly Trp Ala Asn Gly Gly Arg Arg Thr Val Arg Tyr Thr Gly Trp
 50 55 60

Phe Asn Pro Ser Gly Asn Gly Tyr Gly Cys Leu Tyr Gly Trp Thr Ser
 65 70 75 80

Asn Pro Leu Val Glu Tyr Tyr Ile Val Asp Asn Trp Gly Ser Tyr Arg
 85 90 95

Pro Thr Gly Glu Thr Arg Gly Thr Val His Ser Asp Gly Gly Thr Tyr
 100 105 110

Asp Ile Tyr Lys Thr Thr Arg Tyr Asn Ala Pro Ser Val Glu Ala Pro
 115 120 125

Ala Ala Phe Asp Gln Tyr Trp Ser Val Arg Gln Ser Lys Val Thr Ser
 130 135 140

Gly Thr Ile Thr Thr Gly Asn His Phe Asp Ala Trp Ala Arg Ala Gly
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<210> 13

<211> 189

<212> PRT

<213> Thermomonospora fusca

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<212> PRT
<213> Trichoderma harzianum
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85 90 95

Asn Pro Ser Thr Gly Ala Thr Lys Leu Gly Glu Val Thr Ser Asp Gly
100 105 110

Ser Val Tyr Asp Ile Tyr Arg Thr Gln Arg Val Asn Gln Pro Ser Ile
115 120 125

Ile Gly Thr Ala Thr Phe Tyr Gln Tyr Trp Ser Val Arg Arg Asn His
130 135 140

Arg Ser Ser Gly Ser Val Asn Thr Ala Asn His Phe Asn Ala Trp Ala
145 150 155 160

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<210> 15

<211> 178

<212> PRT

<213> Trichoderma reesei Xyl I

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35 40 45

Asn Phe Gly Gly Ser Phe Ser Val Asn Ser Gly Thr Gly Leu Leu Ser
50 55 60

Val Tyr Gly Trp Ser Thr Asn Pro Leu Val Glu Tyr Tyr Ile Met Glu
65 70 75 80

Asp Asn His Asn Tyr Pro Ala Gln Gly Thr Val Lys Gly Thr Val Thr
85 90 95

Ser Asp Gly Ala Thr Tyr Thr Ile Trp Glu Asn Thr Arg Val Asn Glu
100 105 110

Pro Ser Ile Gln Gly Thr Ala Thr Phe Asn Gln Tyr Ile Ser Val Arg
115 120 125

Asn Ser Pro Arg Thr S r Gly Thr Val Thr Val Gln Asn His Phe Asn
130 135 140

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Ser Asn

<210> 16

<211> 190

<212> PRT

<213> Trichoderma reesei Xyl II

<400> 16

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35 40 45

Lys Gly Trp Gln Pro Gly Thr Lys Asn Lys Val Ile Asn Phe Ser Gly
50 55 60

Ser Tyr Asn Pro Asn Gly Asn Ser Tyr Leu Ser Val Tyr Gly Trp Ser
65 70 75 80

Arg Asn Pro Leu Ile Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
85 90 95

Asn Pro Ser Thr Gly Ala Thr Lys Leu Gly Glu Val Thr Ser Asp Gly
100 105 110

Ser Val Tyr Asp Ile Tyr Arg Thr Gln Arg Val Asn Gln Pro Ser Ile
115 120 125

Ile Gly Thr Ala Thr Phe Tyr Gln Tyr Trp Ser Val Arg Arg Asn His
130 135 140

Arg Ser Ser Gly Ser Val Asn Thr Ala Asn His Phe Asn Ala Trp Ala
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<210> 17

<211> 190

<212> PRT

<213> Trichoderma viride

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 35 40 45
 Lys Gly Trp Gln Pro Gly Thr Lys Asn Lys Val Ile Asn Phe Ser Gly
 50 55 60
 Ser Tyr Asn Pro Asn Gly Asn Ser Tyr Leu Ser Val Tyr Gly Trp Ser
 65 70 75 80
 Arg Asn Pro Leu Ile Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
 85 90 95
 Asn Pro Ser Thr Gly Ala Thr Lys Leu Gly Glu Val Thr Ser Asp Gly
 100 105 110
 Ser Val Tyr Asp Ile Tyr Arg Thr Gln Arg Val Asn Gln Pro Ser Ile
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 Ile Gly Thr Ala Thr Phe Tyr Gln Tyr Trp Ser Val Arg Arg Thr His
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 Arg Ser Ser Gly Ser Val Asn Thr Ala Asn His Phe Asn Ala Trp Ala
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 Glu Gly Tyr Phe Ser Ser Gly Ser Ala Ser Ile Thr Val Ser
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<210> 18

<211> 202

<212> PRT

<213> *Fibrobacter succinogenes*

<400> 18

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Thr Tyr Lys Ala Ser Trp Asn Gly Thr Asn Asp Phe Leu Ala Arg Val
          35           40           45

Gly Phe Lys Tyr Asp Glu Lys His Thr Tyr Glu Glu Leu Gly Pro Ile
          50           55           60

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65           70           75           80

Tyr Ile Gly Ile Tyr Gly Trp Thr Val Asp Pro Leu Val Glu Tyr Tyr
          85           90           95

Ile Val Asp Asp Trp Phe Asn Lys Pro Gly Ala Asn Leu Leu Gly Gln
          100          105          110

Arg Lys Gly Glu Phe Thr Val Asp Gly Asp Thr Tyr Glu Ile Trp Gln
          115          120          125

Asn Thr Arg Val Gln Gln Pro Ser Ile Lys Gly Thr Gln Thr Phe Pro
          130          135          140

Gln Tyr Phe Ser Val Arg Lys Ser Ala Arg Ser Cys Gly His Ile Asp
145          150          155          160

Ile Thr Ala His Met Lys Lys Trp Glu Glu Leu Gly Met Lys Met Gly
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Lys Met Tyr Glu Ala Lys Val Leu Val Glu Ala Gly Gly Gly Ser Gly
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<210> 19

<211> 189

<212> PRT

<213> *Aspergillus awamori* var. *kawachi*

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 35 40 45
 Lys Gly Trp Asn Pro Gly Ser Ala Lys Asp Ile Thr Tyr Ser Gly Asn
 50 55 60
 Phe Thr Pro Ser Gly Asn Gly Tyr Leu Ser Val Tyr Gly Trp Thr Thr
 65 70 75 80
 Asp Pro Leu Ile Glu Tyr Tyr Ile Val Glu Ser Tyr Gly Asp Tyr Asn
 85 90 95
 Pro Gly Ser Gly Gly Thr Thr Arg Gly Asn Val Ser Ser Asp Gly Ser
 100 105 110
 Val Tyr Asp Ile Tyr Thr Ala Thr Arg Thr Asn Ala Pro Ser Ile Asp
 115 120 125
 Gly Thr Gln Thr Phe Ser Gln Tyr Trp Ser Val Arg Gln Asn Lys Arg
 130 135 140
 Val Gly Gly Thr Val Thr Thr Ser Asn His Phe Asn Ala Trp Ala Lys
 145 150 155 160
 Leu Gly Met Asn Leu Gly Thr His Asn Tyr Gln Ile Leu Ala Thr Glu
 165 170 175
 Gly Tyr Gln Ser Ser Gly Ser Ser Ser Ile Thr Ile Gln
 180 185

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<212> PRT

<213> Thermomyces lanuginosus

<400> 20

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 20 25 30
 Gly Thr Tyr Glu Ile Ser Trp Gly Asp Gly Gly Asn Leu Val Gly Gly
 35 40 45

Lys Gly Trp Asn Pro Gly Leu Asn Ala Arg Ala Ile His Phe Glu Gly
 50 55 60
 Val Tyr Gln Pro Asn Gly Asn Ser Tyr Leu Ala Val Tyr Gly Trp Thr
 65 70 75 80
 Arg Asn Pro Leu Val Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
 85 90 95
 Asp Pro Ser Ser Gly Ala Thr Asp Leu Gly Thr Val Glu Cys Asp Gly
 100 105 110
 Ser Ile Tyr Arg Leu Gly Lys Thr Thr Arg Val Asn Ala Pro Ser Ile
 115 120 125
 Asp Gly Thr Gln Thr Phe Asp Gln Tyr Trp Ser Val Arg Gln Asp Lys
 130 135 140
 Arg Thr Ser Gly Thr Val Gln Thr Gly Cys His Phe Asp Ala Trp Ala
 145 150 155 160
 Arg Ala Gly Leu Asn Val Asn Gly Asp His Tyr Tyr Gln Ile Val Ala
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Val Gly

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<211> 76

<212> DNA

<213> Trx-1

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cttttacagc tattgg 76

<210> 22

<211> 78

<212> DNA

<213> KyTv-2

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tggtetaact ccggaaac 78

<210> 23

<211> 78

<212> DNA

<213> Trx-3

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ccttataatc cgaatggg 78

<210> 24

<211> 74

<212> DNA

<213> XyTv-4

<400> 24

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gaaaatttcg gtac 74

<210> 25

<211> 51

<212> DNA

<213> Trx-8

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<210> 26

<211> 84

<212> DNA

<213> XyTv-7

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<210> 27

<211> 78

<212> DNA

<213> Trx-6

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<213> XyTv-5

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cttataatgt aacagctttt aaagc 85

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<211> 58

<212> DNA

<213> XyTv-101

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<213> XyTv-102

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<211> 59

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<213> Trx-103

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<211> 69

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<213> XyTv-104

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<210> 33

<211> 67

<212> DNA

<213> XyTv-105

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<212> DNA

<213> XyTv-110

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<211> 54

<212> DNA

<213> XyTv-109

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<211> 60

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<213> XyTv-108

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<210> 37

<211> 66

<212> DNA

<213> XyTv-107

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<213> XyTV-106

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ccaatttagc gtcaattgggt ctaactccgg aaacttcgta ggtggaaaag gttggcaacc 180

cgggaccaaa aataagggtga tcaacttctc tggatcttat aatccgaatg ggaattcata 240

ettaagcgtc tatggctgggt ctagaaaccc actgattgaa tattacattg tcgaaaattt 300

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gaatcacttt aatgcatggg cacagcaagg gttaacccta ggtacaatgg attatcaaat 540

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<213> Tx-105H-1

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<213> Tx-C1

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<213> Tx-del(123-144)-1r

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<213> Tx-105R-1

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<213> Tx-N1

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41

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<213> Tx-75-G1

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<211> 44

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<213> Tx-161R-1r

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<213> Tx-125A 129E-1

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<210> 50

<211> 26

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<213> Tx-116G-1

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<213> Tx-118C-1

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<213> Tx-10H11D-1

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36

<210> 54

<211> 184

<212> PRT

<213> Aspergillus kawachii

<400> 54

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Gly	Val	Ser	Ser	Asp	Phe	Val	Val	Gly	Leu	Gly	Trp	Thr	Thr	Gly	Ser	35	40	45	
Ser	Asn	Ala	Ile	Ser	Tyr	Ser	Ala	Glu	Tyr	Ser	Ala	Ser	Gly	Ser	Ser	50	55	60	
Ser	Tyr	Leu	Ala	Val	Tyr	Gly	Trp	Val	Asn	Tyr	Pro	Gln	Ala	Glu	Tyr	65	70	75	80
Tyr	Ile	Val	Glu	Asp	Tyr	Gly	Asp	Tyr	Asn	Pro	Cys	Ser	Ser	Ala	Thr	85	90	95	
Ser	Leu	Gly	Thr	Val	Tyr	Ser	Asp	Gly	Ser	Thr	Tyr	Gln	Val	Cys	Thr	100	105	110	
Asp	Thr	Arg	Thr	Asn	Glu	Pro	Ser	Ile	Thr	Gly	Thr	Ser	Thr	Phe	Thr	115	120	125	
Gln	Tyr	Phe	Ser	Val	Arg	Glu	Ser	Thr	Arg	Thr	Ser	Gly	Thr	Val	Thr	130	135	140	
Val	Ala	Asn	His	Phe	Asn	Phe	Trp	Ala	Gln	His	Gly	Phe	Gly	Asn	Ser	145	150	155	160
Asp	Phe	Asn	Tyr	Gln	Val	Met	Ala	Val	Glu	Ala	Trp	Ser	Gly	Ala	Gly	165	170	175	
Ser	Ala	Ser	Val	Thr	Ile	Ser	Ser	180											